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(54) **MICROFLUIDIC DEVICES AND METHODS OF USE IN THE FORMATION AND CONTROL OF NANOREACTORS**

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See application file for complete search history.

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(57) **ABSTRACT**

The present invention provides novel microfluidic devices and methods that are useful for performing high-throughput screening assays and combinatorial chemistry. Such methods can include labeling a library of compounds by emulsifying aqueous solutions of the compounds and aqueous solutions of unique liquid labels on a microfluidic device, which includes a plurality of electrically addressable, channel bearing fluidic modules integrally arranged on a microfabricated substrate such that a continuous channel is provided for flow of immiscible fluids, whereby each compound is labeled with a unique liquid label, pooling the labeled emulsions, coalescing the labeled emulsions with emulsions containing a specific cell or enzyme, thereby forming a nanoreactor, screening the nanoreactors for a desirable reaction between the contents of the nanoreactor, and decoding the liquid label, thereby identifying a single compound from a library of compounds.

22 Claims, 17 Drawing Sheets

